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**ARTIFICIAL DISC****FIELD OF THE INVENTION**

This application relates to an artificial prosthetic spinal disc or spinal implant device for replacing a damaged disc yet providing for mobility between the adjacent vertebrae. The implant device is particularly useful in the cervical portion of the spine and even lower where mobility of the vertebral bodies is desirably needed to be maintained.

**BACKGROUND OF THE INVENTION**

Intervertebral discs are soft and compressible. They are interposed between adjacent vertebral body elements of the spine. They act as shock absorbers for the spine, allowing it to flex, bend, and rotate. Degenerative disc disease can occur throughout the spine, but most often occurs in the discs in the lower back (lumbar region) and the neck (cervical region).

As the process of degeneration continues, micro tears or cracks occur in the outer layer (annulus fibrosus) of the disc. The jellylike material inside the disc (nucleus pulposus) may be forced out through the tears or cracks in the annulus, which causes the disc to bulge, break open (rupture), or break into fragments.

The economic impact of degenerative disc disease is enormous accounting for a significant morbidity and lost wages.

The physical properties of the disc are the nucleus pulposus which is composed of type II collagen and the annulus fibrosis which surrounds the disc and gives it significant form. The annulus composed of type I collagen. The nucleus pulposus is largely made up of molecules called proteoglycans. These proteoglycans have an affinity for water. It is this retention of water and the stoichiometry of folded molecules that is responsible for the unique mechanical properties of the disc. If these proteoglycans are depleted, the discs become more rigid and the loss of fluid results in a disc that is thinner and less compliant. Clinically this results in narrowing of the distances between the vertebral elements. This is best seen on magnetic resonance imaging. Typically discs have a bright signal on T2 pulse-weighted sequences and they are hypointense on corresponding T1 images. This is due to the high fluid content of the discs. As the disc loses fluid i.e. the loss of proteoglycans, the disc loses its water signal and becomes anhydrotic and eventually mineralizes. As a result, these individuals develop the symptoms in the spine contributable to loss of the normal disc architecture. As the process of degeneration continues, one develops micro tears or cracks and fissures in the annulus fibrosis and through these cracks and fissures the nucleus pulposus, which is largely gelatinous, may extrude. The extruded disc material may efface the dura and cause significant nerve compression which may result in traumatic neuritic pain and or motor loss.

Once the damage to the disc is so complete the ability to correct the problem is limited to artificial implants to restore the disc space. A more traditional approach was to use a spinal fusion implant that provided the spacing between the vertebral bodies, but thereafter allow bone growth to fuse the adjacent vertebrae together destroying any ability of these fused vertebrae to articulate.

More recently, cervical prosthetic discs have been proposed for the cervical repairs in particular ones that do not fuse the vertebral bodies, but instead allow a limited range of motion. These new articulating implant devices are a better choice until scientists can perfect disc tissue regeneration and natural biologic repair of the nucleus pulposus.

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The present invention as described hereinafter is an improved spinal implant design that enhances mobility and articulation in a self-aligning and reliable construction.

**SUMMARY OF THE INVENTION**

An improved artificial disc has a superior and inferior member. The superior member has an upper body portion and a flange portion for positioning and attachment to an upper vertebral body. The inferior member has a lower body portion and a flange portion for positioning and attachment to a lower vertebral body. The upper body portion and the lower body portions, when positioned in a disc space between the upper and lower vertebral bodies and affixed to a respective vertebral body at the flange portion, are independently movable relative to the other along complimentary bearing surfaces on each of the superior and inferior members. The complimentary bearing surfaces are self-aligned by a magnetic attraction force generated by at least one first permanent magnet in either the inferior or superior member. The inferior or superior member opposite the member with the first permanent magnet has at least one second permanent magnet of opposing polarity relative to the at least one first permanent magnet or has a ferromagnetic composition responsive to the magnetic attractive force to self-align the complimentary bearing surfaces to a null position.

The complimentary bearing surfaces can move relative to the other in any direction by a movement of the vertebral body to which the flange is fixed. The bearing surfaces will maintain an attractive magnetic field to return to contact of the bearing surfaces upon separation during said movement. One or both of the bearing surfaces are made of a ceramic material.

In one embodiment, one of the superior or inferior members or both further has the respective upper or lower body portion formed as a two piece assembly having one base piece fixed to the flange and one movable bearing surface piece slidably engaged to the base piece wherein the bearing surface piece can move directionally anteriorly or posteriorly relative to the base.

The bearing surfaces preferably include one convex surface and one complimentary concave surface and wherein the surfaces are translatable about the other. In another embodiment, the improved artificial disc further has an intermediate bearing layer interposed between the bearing surfaces. The intermediate bearing layer conforms to either the convex or concave surface or both. The intermediate bearing layer can be made of a compressible cushion polymer. The intermediate bearing layer also can have magnetically attachable particles intermixed in the polymer.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be described by way of example and with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of the implant device of the present invention.

FIG. 2 is a cross-sectional perspective view of the implant device of FIG. 1.

FIG. 3 is a second perspective view of the implant device of FIG. 1.

FIG. 4 is an exploded perspective view of the implant device shown in FIG. 3.

FIG. 5 is a plan view of the implant device of FIG. 1.

FIG. 6 is a perspective view of a first alternative embodiment of the implant device exhibiting an intermediate layer positioned between bearing surfaces.